TRANSLATION

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Form PCT/IPEA/416
V53018WO		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/DE2004/002416	30.10.2004	08.11.2003
International Patent Classification (IPC) or national classification and IPC		
B23P15/10, F02F3/22, F16J1/00, F02F3/00		
Applicant		
MAHLE GMBH		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 7 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☐ *(sent to the applicant and to the International Bureau)* a total of _____ sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))
      _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/DE2004/002416

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

☐ international search (Rule 12.3 and 23.1(b))

☐ publication of the international application (Rule 12.4)

☐ international preliminary examination (Rule 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1-4 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☒ the claims:

nos. 1-4 as originally filed/furnished

nos.* _____ as amended (together with any statement) under Article 19

nos.* _____ received by this Authority on _____

nos.* _____ received by this Authority on _____

☒ the drawings:

sheets 1/3-3/3 as originally filed/furnished

sheets* _____ received by this Authority on _____

sheets* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/DE2004/002416

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-4	YES
	Claims		NO
Inventive step (IS)	Claims	1-4	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-4	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

1. This report makes reference to the following documents:

D1: DD 142 372 A1 (WIESNER et al) 18 June 1980
D2: US 4 651 631 A (AVEZOU ET AL) 24 March 1987
D3: PATENT ABSTRACTS OF JAPAN Vol. 017, No. 701 (M-1533), 21 December 1993 -&; JP 05 240347 A (HINO MOTORS), 17 September 1993
D4: DE 197 22 053 A1 (KS KOLBENSCHMIDT GMBH) 3 December 1998
D5: CH 374 855 A (KARL SCHMIDT GMBH) 31 January 1964

2.1 Document D1 is considered the closest prior art and discloses (*see, in particular, page 4, lines 23-32; the claims and figure 2*) a method for producing a piston for an internal combustion engine according to the preamble of claim 1, more particularly:
a method for producing a piston for an internal combustion engine
- with a substantially cylindrical base body that is made of aluminium and one end of

which forms a piston head;

- with pin bosses with boss holes on the underside of the base body facing away from the piston head; and
- with shaft elements which interconnect the pin bosses.

The subject matter of independent claim 1 differs from that known method in that:

- the base body (4) is produced in the forging process, a recess (22) being formed in the radial outer edge area of the piston head (5);
- the free arm (13, 14) of a substantially toroidal cooling channel (15) which has a C-shaped cross-section, is radially outwardly open and is made of sheet steel is welded to a radially inner, cylindrical surface (12) of a ring carrier (10) made of Ni-resist;
- the ring carrier (10) provided with the cooling channel (15) is cast into an aluminium ring element (6) in the compound casting process, said element thus being given a shape which allows it to fit into the recess (22);
- the ring element (6) is fitted into the recess (22) and is welded to the base body (4); and
- the piston (1) is given its end shape by a metal-cutting finishing process.

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

In order to produce an aluminium piston, D1 produces an aluminium base body and an aluminium ring element in order to reinforce the edge area of the piston during the casting process. A recess for a cooling channel is incorporated into the ring element. A steel ring is then welded to the base body and the ring element is welded to the base body provided with the steel ring. In a final step, a piston ring groove for a compression ring is formed in the steel ring. The complexity of the production process is a disadvantage.

The current invention can therefore be considered to address the problem of overcoming the aforementioned disadvantage.

Document D2 (*see, in particular, column 2, line 42 to column 4, line 52 and figures 1-4*) discloses (*the references between parentheses refer to that document*):
a method for producing a piston for an internal combustion engine according to the preamble of claim 1, in which the base body is produced in the forging process and a recess is formed in the radially outer edge area of the piston head.

According to D2, a fibre-reinforced ring (35) is cast in the squeeze casting process (squeeze casting) into an aluminium ring element (11) and a cooling channel (13), which is not connected to the ring element, is formed using a dissolvable salt core (*see, in particular, column 4,*

lines 46-52).

The ring element (11) is fitted into the recess and welded to the base body (4).

D2 does not disclose (even in the other embodiments shown in the document) a ring carrier that is provided with a cooling channel and is produced according to the method as per claim 1.

Each of documents D3 and D4 discloses a method for producing ring carriers with cooling channels, in which the free arm of a substantially toroidal cooling channel which has a C-shaped cross-section, is radially outwardly open and is made of sheet steel is welded to a radially inner, cylindrical surface of a ring carrier made of Ni-resist. The ring carrier provided with the cooling channel is then cast in the compound casting process into an aluminium piston (not into a ring element).

Document D5 discloses a method for producing a lightweight metal piston for internal combustion engines, a coolant-receiving body being provided in the head of the piston, a circulatory recess being produced in the head of a forged piston, the coolant-receiving body being cast or injected into the recess in such a way that the casting or injecting material completely fills the recess and in addition is bonded firmly to the piston material.

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

The features of claim 1 are therefore neither disclosed nor suggested by the prior art.

Claim 1 thus meets the criterion in PCT Article 33(1) in respect of novelty and inventive step.

2.2 Claims 2-4 are dependent on claim 1 and therefore likewise meet the PCT requirements for novelty and inventive step.